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AUTHOR	Buriak, John P.
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ABSTRACT

This final report of a curriculum research project conducted to develop a competency based curriculum for the mining and related industries is presented in three parts. First, the activities that took place during the last two months of the project are summarized. Second, an overview of the accomplishments of the project during the entire funding period of fourteen months is reported. Finally, a self-assessment of the curriculum development process is presented in the following ten stages: formation of the general advisory committee; formation of the technical advisory committee; development of task title listing; interviews with miners; writing the task sheets; developing the recommended courses of study; review and evaluation; dissemination; implementation; and updating and revising the curriculum. A chart illustrating current progress and curricular areas which need further development concludes the report. (BM)

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FINAL REPORT

Project Title:

Competency Based Curricula Development for the Mining and Related Industries

Project No.:
498AH460252

Grant No.:
G007603870

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Submitted By:

John P. Buriak
Admiral Peary Area Vocational-Technical School
Ebensburg, PA 15931

Date:

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Background

The Final Report for Grant No. G007603870, a curriculum research project entitled "Competency Based Curricula Development for the Mining and Related Industries," serves two purposes. First, it contains a summary of the activities which took place during the last two months of the project, July 1 - August 31, 1977. Second, the report gives an overview of the accomplishments of the project during the entire funding period: July 1, 1976 - August 31, 1977. The Final Report also discusses the future of the project in its efforts to complete and disseminate the curricula for the mining occupations.

The principle objective of the curricula development project for mining is to provide miner training efforts with a comprehensive set of effective instructional materials. The motivating philosophy behind the project is the realization that the curricula must be targeted specifically to the mining occupations and to the miners themselves. The unique environment in which the miner works, and the uniqueness of mining terminology, had to be recognized in the curricula if the communication of knowledge through the teaching process is to be accomplished.

The curricula is being developed in the competency based format with which the Admiral Peary Vo-Tech played a major part developing for vocational education nationwide. The advantages of individualized competency based curricula have been discussed at great length in educational publications, but the advantages to the mining industries are particularly great. The rapid technological changes caused by the sudden rises in demand for coal make traditional curricula texts outdated before they are even published. The changes in mining laws and safety regulations also have a great affect on the content of curricula, and the competency based format in uniquely capable of

keeping pace with these changes. The capability of targeting courses of study to specific training needs is extremely valuable to an industry which foresees major problems in keeping the needed training in pace with its growth.

During the course of the curricula development project, a headstart was made on creating a core of mining curricula materials especially suited for vocational education at the secondary and adult (postsecondary) levels. The specific accomplishments of the 14 month project were:

1. The establishment of a career lattice applicable to the deep mine industries, showing the paths of vertical and horizontal job mobility;

2. The identification of the five major job categories in deep mining: General Mining, Construction/ Masonry, Maintenance Mechanics, Electricity, and Machine Operation;

3. The establishment of three technical advisory committees - in General Mining, Construction/Masonry, and Electricity - in order to identify the units, modules, and tasks needed for the occupations included within each category.

4. The "completion" (competency-based curricula is never "complete" as tasks are continually added, deleted, or revised) for curricula and recommended courses of study for the following deep mine occupations:
   - *Entry Level Orientation
   - *General Inside Laborer/Timber Framer
   - *Face Worker
   - Precision Mason
   - Stopping Builder (Bratticer)
   - Welder Mechanic

   *These recommended courses include the minimum training requirements soon to be enacted by MESA.

5. The identification of all of the curricula units and modules needed by the electrician or maintenance mechanic in the deep mine. The Technical Advisory Committee on Mine Electricity is currently meeting with the Vo-Tech staff bi-weekly to identify all of the tasks contained in each module.

6. The identification of the units and most of the modules needed for mine maintenance mechanic. In September or early October the Technical Advisory Committee for Maintenance Mechanics will be formed to complete the identication of all the units, modules, and tasks in this curricula category.

7. The completion of the Mining Instructor's Manual on using the curricula and recommended courses of study.

PROJECT TIMETABLE FOR
FINAL REPORTING PERIOD

July 1, 1977 - August 31, 1977

The activities and accomplishments of the final two months of the project are listed below:

July 1, 1977 — Writers continue to review electrical task listing with mining personnel and curricula coordinators.

Illustrator begins illustrating task sheets in electricity which can be used or which have been revised for use in the Mine Electricity curricula.

July 7, 1977 — Curricula coordinator meets with Mr. James McGoye, Director of Apprenticeship and Training, Mining Enforcement and Safety Administration. Purpose of meeting is to design pilot program for using curricula to meet the training requirements soon to be enacted by Congress, and enforced by MESA.

Also discussed is the use of the curricula in the AMERITEC mining school project for which MESA was appropriated funds to conduct a feasibility study.

July 1 - Aug. 15, 1977 — Preliminary list of units and modules for Mining Electricity and Mine Maintenance Mechanics are completed by writers. Notations are made as to relevant task titles which had been identified in each unit and module. The task titles are further notated as to status of accompanying task sheets ("completed," "uncompleted," "needs revision")

August 3, 1977 — Technical Advisory Committee for Mine Electricity meets. Outline of units and modules reviewed, revised, and expanded. Work begins on breaking modules into individual performance tasks.

August 8, 1977 — Copies of Curricula outline for Mine Electricity sent to all members of General Advisory Committee for the Mining and Related Industries for their review.

August 15, 1977 Final day for the curricula development team, consisting of the two writers and the illustrator.

August 17, 1977 Work on Final Report begins by the curricula coordinators, the project director, and the business manager.

September 20, 1977
Final Report is completed and submitted to the U.S.O.E.

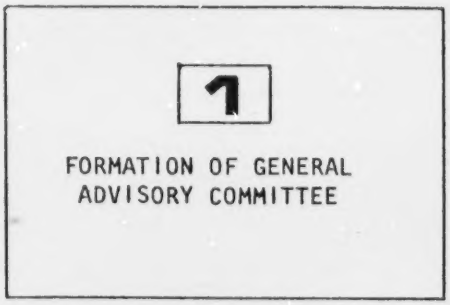
THE CURRICULA DEVELOPMENT PROCESS-

A SELF-ASSESSMENT

SUMMARY:

The General Advisory Committee (GAC) was extremely important in helping to develop the objectives and plan of action for the curricula development project. The school utilized the already active General Advisory Committee for the Mining and Related Industries Facility to act as the GAC for the curricula project.

The GAC was made up of high level management people in the mining and electric power industries, union officials from the United Mine Workers, federal and state mine safety inspectors, and a physician.



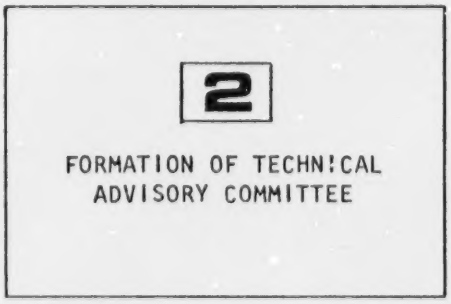
The GAC, collectively and as individuals, assisted the project coordinators with establishing an accurate mining career lattice, identifying the skill areas where curricula was needed, and forming the Technical Advisory Committees for each area. The five skill areas were: General Mining, Construction/Masonry, Mine Maintenance/ Mechanics, Mine Electricity, Machine Operation.

ASSESSMENT:

The involvement of an active GAC consisting of people capable of making decisions on behalf of their company, union, or agency was a tremendous advantage to the project. The GAC greatly facilitated the other steps in the curricula development process.

SUMMARY:

The Technical Advisory Committees (TAC) consisted of mining personnel who had direct working knowledge of the skills needed in each curricula area. The main function of the TAC was to provide the expetise needed by the writers to develop the task sheets. In the more complex curricula areas the TAC was important in developing the curricula outlines needed by the writers for the interviews. The TAcs were also important in the review of the completed task sheets, and in the development of the recommended courses of study for each occupational title.



ASSESSMENT:

At the project's outset the Technical Advisory Committee (TAC) consisted of the mining personnel who assisted with the curricula development through the interview process. The TAC seldom met as a group, but was used after the interviews for review of the curricula. This was the method of utilizing the TAC in the areas General Mining and Construction/Masonry. The curricula outlines in these areas (unit, module, and task titles) was prepared for the writers by one of the curricula coordinators, whose background was mining and mining instruction.

SUMMARY:

The task listing, or task title glossary, was prepared in advance of the interview process. The procedure for this usually meant identifying the units first (major divisions) and then modules (sub-divisions) for each of the five curricula areas. Then the individual performance tasks needed in each module were identified and titled. The task listing was reviewed by the TAC and the GAC.

3

DEVELOPMENT OF TASK TITLE LISTING

ASSESSMENT:

Experience with developing task sheets has shown that a complete outline giving unit, module, and task titles should be provided the writer(s) before they begin their interviews. This gives the writer a good feel for the content and organization of the area of instruction, and permits him or her to concentrate on the individual task sheet development. Previously, the writers and coodrinators worked through the interview process to develop this outline and its task title listings. The use of the TAC to develop the outline prior to the interviews proved to be a more efficient procedure, although it meant a much more extensive use of the TAC. Fortunately, the TAC members for this project were capable of and willing to meet often with the curricula coordinators.

SUMMARY:

In the interview process, the writers and illustrator met individually with the mining personnel whose jobs were directly related to the curricula area being developed. The interviews usually lasted one week, during which time the miners provided the writers with the information needed to write the task sheets for each task title. The coordinators often assisted with the interviews. During this stage some revisions in the curricula outlines were made: task titles were combined into one task sheet and title, or one task title was broken down into two or more.

4

INTERVIEWS WITH MINERS

ASSESSMENT:

The interview was the heart of the curricula development project, also the most demanding of thoughtful attention. It was important that all the elements of the interview worked properly: the interviewer, the interview process, and the person being interviewed.

The writers selected for the project were screened for both their writing abilities and their ability to communicate verbally and conduct an interview. The interview process was organized so that the mining personnel felt at ease and were well aware of what was being developed and what types of information they could provide.

The person selected for the interview was a crucial part of this phase. The GAC often recommended people who were in management positions and who had not worked directly with the skills being developed for a year or more; or people were recommended who were skilled engineers strong in the theory of mining but weak in the knowledge of the actual psycho-motor skills involved. It was the job of the coordinators to stress to the GAC that miners directly involved in the skills to be taught were the type needed for the interviews.

The ideal interviewee was the working miner who had a good sense of both the theory and performance of the skills of his job. The coordinators found that they were able to identify such people at each job level being developed, from the miner laborer to the foreman level, through the GAC and the TAC once it was made clear the type of person needed in the interview.

SUMMARY:

The task sheets were generally written during a one or two week writing period following the one week interview. During this period the notes gathered for each task title were written into the standard task sheet format which consisted of:

1. Task title and coding information
2. Objective (performance objective)
3. Introduction (importance and relevance of task)
4. Procedure (for performance of task)
5. Review Questions (if applicable)
6. Information Sheets (referred to under Procedure)

5

WRITING THE TASK SHEETS

ASSESSMENT:

Experience again showed that the most efficient method of writing the task sheets involved the writers in taking notes on each section of the task sheet during the interview. The task sheets and attached information sheets were then written from these notes during the writing period. This proved to be a more time effective method, and the writers could always gain access to the interviewed miners for further questions during the writing period. Occasionally, when the interviews produced large amounts of information, both writers would work together: one would interview while the other took notes. Generally, though, the writers worked separately, so that while one was interviewing for a week, the other was writing up his or her notes from the previous interview.

It was extremely important that the writers target the text of the task and information sheets to the general reading level of the miners. Wherever possible, commonly used terminology for machines, equipment, work procedures, etc. were used or referred to in the text of the written material.

The illustrator worked closely with the writers and the mining personnel during the interviewing. At the interview stage, the illustrator would make the sketches with the aid of the miner, and make the finished illustration at a later time.

The illustrator and writers took trips to the mine sites with the miners whenever it was felt that such on-site visits were necessary for them to visualize and communicate some aspect of the curricula.

The writers and illustrator were given two week seminars by the coordinators on the format and content characteristics of the task sheets prior to commencement of the writing process.

SUMMARY:

The recommended courses of study were developed by the curricula coordinators with the TAC, and reviewed by the GAC. The recommended courses of study were organized and identified by the major occupational titles found in mining.

6

DEVELOPING THE RECOMMENDED COURSES OF STUDY

ASSESSMENT:

The Admiral Peary Vo-Tech has always utilized the "recommended courses of study" in its competency-based curricula system. These courses of study list the tasks recommended for instruction towards the various occupational titles.

The recommended courses of study are not binding courses, they are just starting points and guides in the process of developing the individualized courses of study at both secondary and adult education levels. A brief examination of the unit, module, and task titles contained under each occupational title also gives the student an excellent idea of the types of skills and work involved in each particular job.

The TAC members were the logical people to devise these recommended courses of study, and it was logical for them to do this while they were identifying the task titles needed in each curricula area.

SUMMARY:

Review and evaluation of the task sheets and the supportive curricula materials (i.e. the recommended courses of study, and the Instructor's Manual) went through its first stages immediately after the task sheets for each area were completed. The review process followed these steps:

7

REVIEW AND EVALUATION

1. Review and proofing by coordinators and the mining instructor;
2. Review and proofing by the TAC and any other persons involved in the interviews;
3. Review by the General Advisory Committee members and their companies, agencies, or organizations.

After this review the task sheets and Instructor's Manual were bound together for ease in handling and submitted to the following agencies or organizations for further review and evaluation:

1. The Mining Enforcement and Safety Administration, Office of Apprenticeship and Training
2. The Pa. Office of Deep Mine Safety
3. The U.S. Office of Education, Vocational Education Research Program
4. Garrett Community College, Maryland
5. The Pa. Director of Vocational Education
6. The Coal Mining Educators Association of Central Pa.

ASSESSMENT:

The initial review of the curricula materials involved several agencies, companies, and organizations likely to benefit from the curricula's implementation. The review process served the dual purpose of notifying these sources of the availability of the curricula, as well as providing additional evaluative in-put into the curricula and its supportive materials.

The evaluation of the curricula through actual classroom use is being accomplished through three primary sources:

1. Through the training programs of the GAC companies,
2. Through the new mining componant being established at Garrett Community College in Maryland,
3. and through the secondary and adult classes at the Admiral Peary Vo-Tech.

SUMMARY:

Initial dissemination of the curricula was done primarily through the review process. Full scale dissemination, under the protection of a limited copyright, will be done by a professional publishing company. This dissemination is expected to begin in the fall of 1977 or the winter of 1978.

8

DISSEMINATION

ASSESSMENT:

The Admiral Peary Vo-Tech searched for a dissemination method which could distribute the curricula in the quantities needed, and at minimal costs to the program seeking the materials. At the recommendations of the U.S.O.E. a limited five year copyright was obtained, and potential publishers are currently being contacted. The Vo-Tech will be seeking a publisher who can provide an effective dissemination plan while keeping the cost of the materials low. The Vo-Tech also plans to directly assist its curricula development efforts through the royalties generated by the curricula.

SUMMARY:

Implementation, of course, will not really begin until full scale distribution of the curricula can be achieved. Initial implementation of the curricula is currently taking place as part of the review and evaluation process, as described in the Review and Evaluation section.

9

IMPLEMENTATION

The following educational programs and institutions are aware of the curricula development project, and are anticipated to be among the first utilizers of the materials:

1. The companies (17) represented on the General Advisory Committee, for their internal training programs;
2. The Mining Enforcement and Safety Administration, in its pilot program to assist coal companies in meeting new training requirements;

3. The Pennsylvania Department of Education which is attempting to encourage the greater vocational training for the mining industry in the state's vo-techs;
4. Garrett Community College in Maryland, which is utilizing Admiral Peary Vo-Tech staff in developing their new mining program.
5. The Kentucky State Department of Education, which is under contract with the Appalachian Regional Commission to develop miner training programs at five of its vo-tech schools,
6. The Belmont Joint Vocational School in Ohio which operates mine training courses in conjunction with the simulated mine facility in Clarington, Ohio.
7. The M.E.S.A. Academy at Beckley, W. Va., which serves as a resource center for the nation's mining industry.

ASSESSMENT:

Not available at this time.

SUMMARY:

One advantage that is always associated with competency based curricula is the ease with which it can be continually up-dated and revised. Whereas textbooks are often partially outdated before they even leave the presses, task sheets can easily be deleted, added, or re-written in order to keep the curricula up to date.

10

UP-DATING AND REVISING THE CURRICULA

This advantage, however, is not one that is automatically gained. Any curricula system will lose its relevancy in a world of shifting technologies if a very conscious and concerted effort is not made to keep it up to date.

The Admiral Peary Vo-Tech attempts to keep all of its curricula relevant to the realities of the world of work by insisting on the instructor's involvement in writing and revising task sheets. The instructors are strongly encouraged to modify or create new task sheets, and time is set aside at the end of each school day for this purpose.

The Technical Advisory Committees also play an important role in up-dating the curricula. As a group, and as individuals, the TAC provides the school with a direct link to the changing nature of the jobs for which Vo-Tech students are being prepared.

In mining, the TACs and the General Advisory Committee will continue to meet several times per year in order to keep the new mining curricula at pace with the rapidly changing technologies which characterize the industry.

Completing the Curricula

Under the fourteen month grant from the U.S. Office of Education, Vocational Education Research, the Admiral Peary Vo-Tech was provided the means by which a much needed curricula could be researched, developed, and implemented. There is much more which needs to be done, however, before vocational education can claim to have access to adequate competency-based curricula for the mining occupations.

The chart on the following page illustrates the curricula areas which need to be developed to create courses for present occupations in the mining industry. However, new occupations generated by new technologies will be inevitable by-products of the push to double coal output by 1985. For the next ten years, at least, it is logical that a relatively high level of curricula development will need to take place if vocational education is to begin providing adequate job preparation for the people in, or going into, the mining industry.

The Admiral Peary Vo-Tech plans to tap a variety of federal, state, local, and private funding sources to assist vocational education in meeting its responsibilities towards the nation's most hazardous and most underdeveloped major energy industry.

What Has Been Done and What Needs To Be Done

Formation of Tech. Adv. Committee	Identify Units Modules and Tasks	Interview Miners	Write Task Sheets	Review Tasks and Rec. Course of Study	Evaluate	Computerize and Disseminate

General Mining

Completed

To be done

Mine Construction/Bratticing

Completed

To be done

Electricity

Completed

Partially completed. All Units and Modules identified. Approx. 40% of tasks identified and written into task sheets.

To be done

Maintenance Mechanics

Core of Units and Modules identified. Technical Advisory Comm. to complete identification of Tasks and additional Units and Modules. All tasks for Welding Mech. completed.

To be done

Machine Operation

Tech. Adv. Comm. for Modern Methods Mining has done work in this area.

To be done